Wandle Way Project Report

Air and Noise Pollution Insights

25th March - 25th September 2024
6 Month Summary Report

EMSOL's mission is to deliver innovative solutions which empower our customers to take steps every day which make a lasting improvement to respiratory health. The EMSOL system improves the local environment. This is through targeted air, noise pollution monitoring.

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EMSOL Waste Management Video

EMSOL: Winner London Tech Week 2020 - Tech for Good and Mayor of London Civic Innovation Challenge. Selected by Tech Nation as top innovators for Net Zero solutions. Most innovative transport air pollution solution award at the UK Transport Awards 2022. Top 50 EnviroTech company 2023 & 2024.

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Project Outline

The EMSOL and Cross River Partnership (CRP) project at Willow Lane industrial estate on Wandle Way monitored air and noise pollution from waste, construction and other industrial activities in Merton. This initiative, which forms part of the DEFRA-funded Smarter Greener Logistics programme, focussed on reducing the air quality and noise impact of freight, through real-time monitoring of emissions and noise levels in a pollution hotspot area where visible dust pollution has become a serious concern for local residents and workers.

Using EMSOL's innovative technology, the project set out to baseline data and identify pollution causality, with a focus on vehicular activities. The six month project (25th March 2024 - 25th September 2024) gathered data on Particulate Matter (PM2.5 & PM10), Nitrogen Dioxide (NO2) and noise. Two air and noise monitoring zones were set up at the North and South Zones of Wandle Way to provide a direct comparison between contrasting areas of the site (Figure 1).

This data will be used to influence interventions to improve air quality in the local area. EMSOL and CRP will work with stakeholders, including the London Borough of Merton, the local Business Improvement District, and the Environment Agency to foster collaboration and develop long-term solutions to mitigate the environmental impact of activity in Wandle Way. Outcomes from this pilot project could promote future initiatives across other London locations to reduce pollution and improve wider urban air quality, particularly at industrial and logistics sites.

Figure 1: Location of EMSOL's two air and noise quality monitoring stations on Wandle Way, Merton. Deployed from March to September 2024.

DEFRA and WHO Standards

Annual Mean Summary Tables

Organisation	Measure	Must Be Below	Year To Date	Current Status
DEFRA (Legal Requirement)	PM10 Annual Mean	40 µg/m³	18.18 µg/m³	OK
DEFRA (Legal Requirement)	PM10 Daily Mean > 50 µg/m³	35 days a year	0 days	OK
DEFRA (Legal Requirement)	PM2.5 Annual Mean	20 µg/m³	8.26 µg/m³	OK
DEFRA (Legal Requirement)	NO2 Annual Mean	40 µg/m³	39.64 µg/m³	OK (Warning)
WHO Guidelines (2021)	PM10 Annual Mean	15 µg/m³	18.18 µg/m³	Fail
WHO Guidelines (2021)	PM2.5 Annual Mean	5 µg/m³	8.26 µg/m³	Fail
WHO Guidelines (2021)	NO2 Annual Mean	10 µg/m³	39.64 µg/m³	Fail

For indicative purposes only. You should not rely on this for legal purposes.

Figure 2a: North Zone

Organisation	Measure	Must Be Below	Year To Date	Current Status
DEFRA (Legal Requirement)	PM10 Annual Mean	40 µg/m³	25.30 µg/m³	OK
DEFRA (Legal Requirement)	PM10 Daily Mean > 50 µg/m³	35 days a year	9 days	OK
DEFRA (Legal Requirement)	PM2.5 Annual Mean	20 µg/m³	8.96 µg/m³	OK
DEFRA (Legal Requirement)	NO2 Annual Mean	40 µg/m³	40.35 µg/m³	Fail
WHO Guidelines (2021)	PM10 Annual Mean	15 µg/m³	25.30 µg/m³	Fail
WHO Guidelines (2021)	PM2.5 Annual Mean	5 µg/m³	8.96 µg/m³	Fail
WHO Guidelines (2021)	NO2 Annual Mean	10 µg/m³	40.35 µg/m³	Fail

For indicative purposes only. You should not rely on this for legal purposes.

Figure 2b: South Zone

Figures 2a and 2b detail an executive summary of the annual means recorded by EMSOL Air Quality Monitoring stations from 25th March 2024 - 25th September 2024, in comparison to DEFRAs National Air Quality objectives and World Health Organisation (WHO) guidelines. For the purposes of the report, the DEFRA National Air Quality objectives will be used as a comparison, aligning with the London Borough of Merton's own comparison. As can be seen in Figures 2a and 2b, the WHO 2021 guidelines are lower and more stringent which act as a global aim to improve citizen and population health.

In the London Borough of Merton, data is collected for NO2, PM2.5 and PM10 through continuous (e.g. referencing stations, Breathe London nodes) and non-continuous monitoring methods (diffusion tubes). The latest 2024 Air Quality Action Plan shows that:

- Most residential and commercial sites monitored experience lower than the Defra legal limits for NO2, although some commercial areas where traffic volumes are higher exceed this limit.
- Most residential and commercial sites monitored experience lower than the Defra legal limits for PM2.5 and PM10, although there are seasonal variations to this. There are some exceedances seen, and these are likely attributed to commercial or industrial areas where traffic volumes and other sources of pollution are more prevalent.

Industrial land use, such as Wandle Way, is likely to intensify existing air quality challenges, as activities associated with the manufacturing, production, extraction or processing of materials will produce waste products and emissions that are harmful to human health. These include NO2, PM2.5 and PM10, which are produced from the burning of fossil fuels, which will power heavy vehicles seen at industrial sites and be responsible for running day-to-day activities. This should be considered when the data is presented below.

Air Quality - 6 Month summary

24 Hour Averages

In the graphs below, each column is a 24-hour average (mean) level for a specific day. DEFRA has a published set of recommended levels for these averages. Where a day is coloured green, it is below the DEFRA National Air Quality limit (shown by the red line on each graph). When it is orange, it is above the DEFRA limit. Please bear in mind that there may not be complete data for every day of the year, and therefore the overall conclusion may change and/or not be correct. The mean level is also compared to DEFRAs National Air Quality objectives. The orange lines on the graphs denote WHO Air Quality interim targets, whilst the green demonstrated the Air Quality Guidelines.

How are PM10 levels meeting standards and guidelines

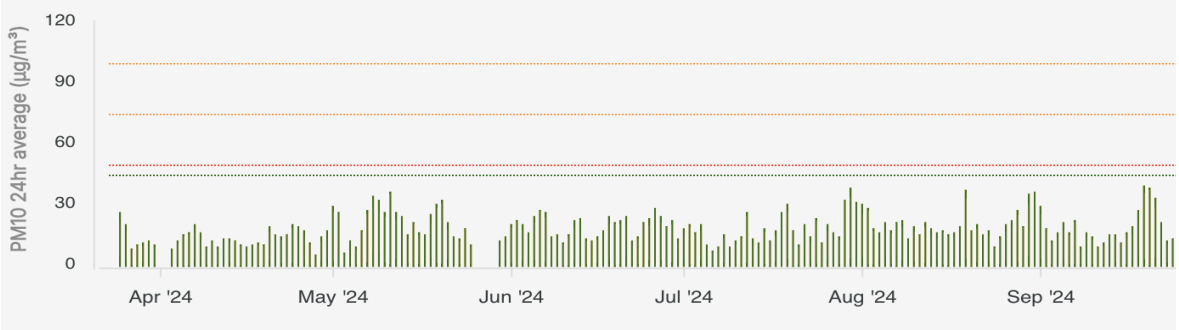


Figure 3a: North Zone

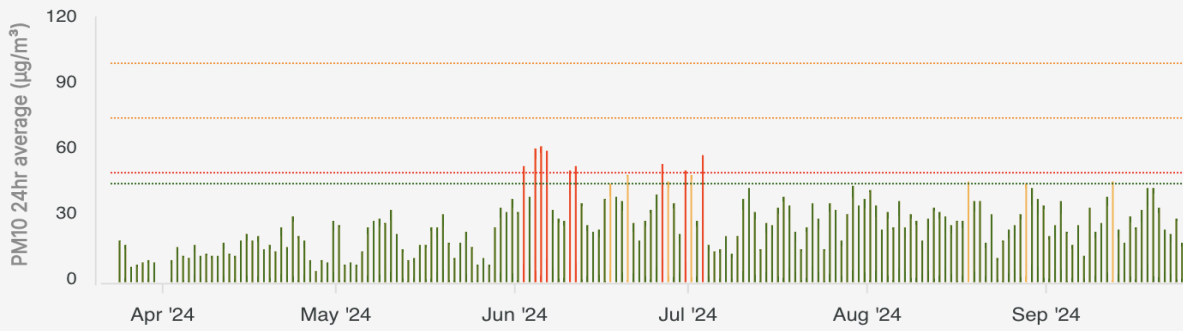


Figure 3b: South Zone

- The annual mean and daily average of PM10 levels varied significantly between the North and South Zones, with the South Zones annual mean 7.12µg/m^3 higher than the North Zone. Both zones remained below the DEFRA standard. Additionally, the South Zone recorded 9 days where the daily mean was greater than 50µg/m^3, whereas the North Zone recorded none. The highest daily average was recorded at 62µg/m^3 (6th June 2024). Likely influences on these high-pollution days were a combination of hot, dry weather and increased vehicular and waste activity at the busier South Zone. Although this met the DEFRA standard, it did not meet the more stringent WHO AQG (15µg/m^3).

How are PM2.5 levels meeting standards and guidelines

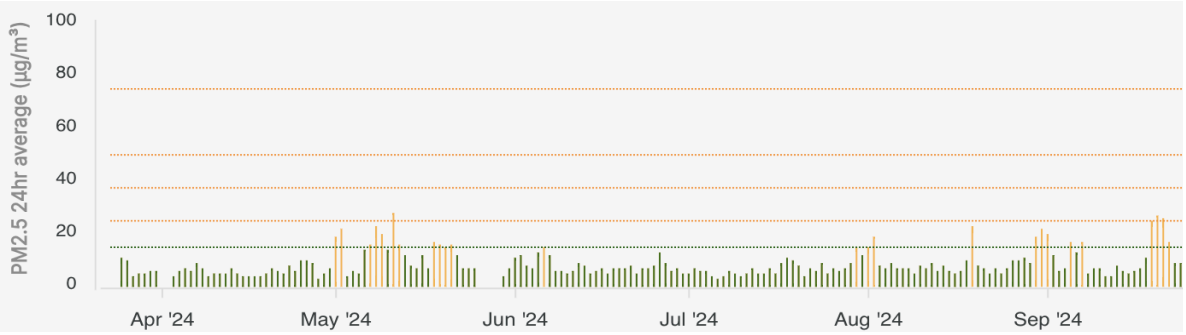


Figure 4a: North Zone

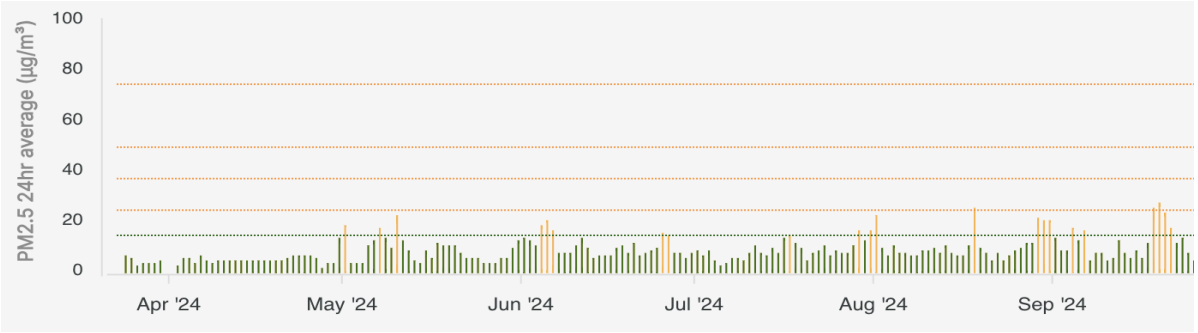


Figure 4b: South Zone

- PM2.5 annual means during the project met DEFRA legal requirements. Similarly, small periods of increased daily averages were identified at both zones. These jumps often coincided with an increase in pollution alerts generated. A variety of factors may have influenced this, including increased transport, congestion, on-site construction and waste/industrial activity in the area, and weather conditions. Once more, despite meeting DEFRA legal requirements, PM2.5 did not meet the more stringent WHO AQG (5µg/m^3).

How are NO2 levels meeting standards and guidelines

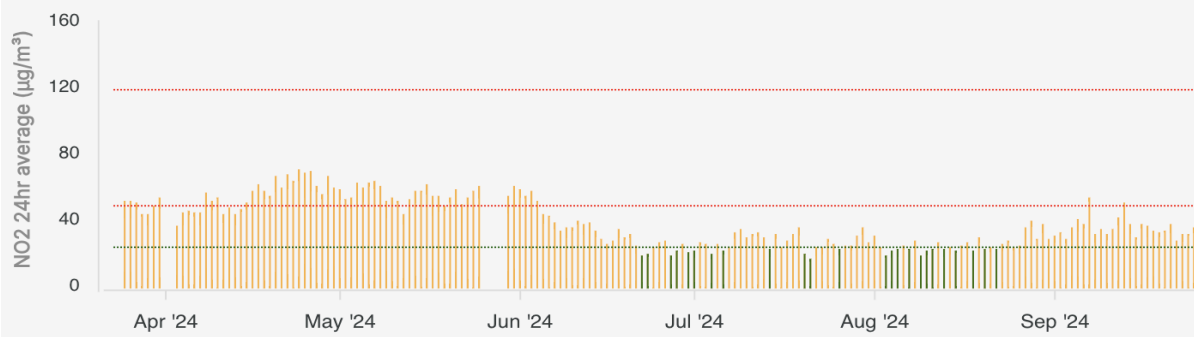


Figure 5a: North Zone

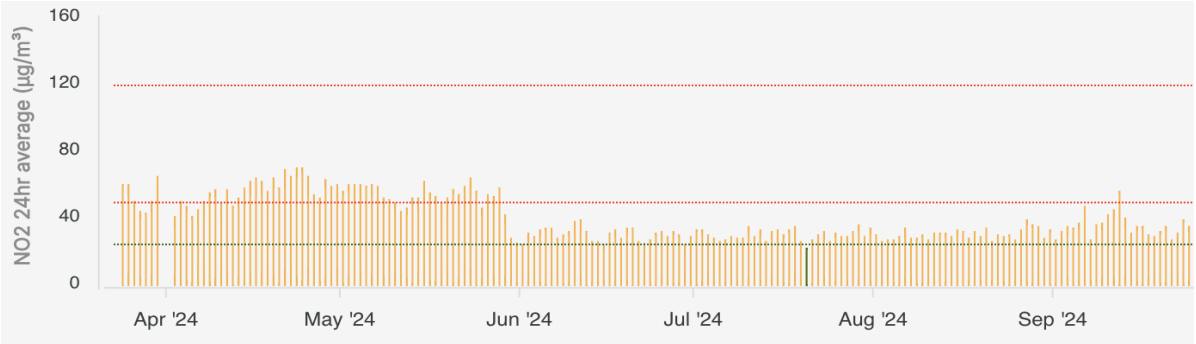


Figure 5b: South Zone

- At the North Zone, Nitrogen Dioxide levels did not meet DEFRA legal requirements, whilst the South Zone was marginally below (0.59µg/m^3). Daily averages did show a significant drop throughout the summer months, but this is consistent with seasonal variation. Averages at both zones began to display a slight rise during September as temperatures and sunlight hours decreased, which is a contributing factor to higher nitrogen dioxide levels. At both zones, the North and South Zone failed the WHO AQG of 10µg/m^3

Pollution Alerts

Pollution alerts are episodes of high, short-term instances of pollution. EMSOL's camera technology integrated with air and noise quality monitors enables video footage to capture activity in a localised area when pollution alerts occur, providing insights into pollution causality. Pollution thresholds were put in place at the beginning of the project following analysis of baseline background pollution levels, and when levels exceed these thresholds an alert is generated. Data was recorded in real-time 10 second intervals.

EMSOL's monitoring stations were deployed and powered on lighting columns, and placed in fixed positions following a site survey. Camera view angles were determined during the site survey to capture areas with the majority of vehicular activity. Camera footage is only recorded during pollution alerts, and EMSOL technology is GDPR compliant, with suitable GDPR signage deployed for the project duration. Note not all pollution alerts can be attributed to a possible cause. EMSOL air and noise monitors were kept operationally fit for purpose and maintained throughout the project.

The following pollution alert thresholds were set from the project outset:

- PM10: 200µg/m^3
- PM2.5: 50µg/m^3
- NO2: 90µg/m^3
- Noise: 100dB

During the 6-month period, PM10 and NO2 thresholds were held the same. The PM2.5 threshold was dropped to 35µg/m^3 on 22nd April for the remainder of the project. Noise thresholds were reduced to 90dB on 27th May, and further to 85dB on 3rd June, before being increased to 95dB on 10th June for the remainder of the project. Thresholds were altered during these periods to try and improve understanding of the activity associated with PM2.5 and noise pollution following discussions with CRP and London Borough of Merton.

- A total of 2,545 air and noise pollution alerts were recorded during the 6-month project.

- **North Zone:** 1,240 pollution alerts tagged, of which 958 could be linked to a likely cause (77.3%).

- **South Zone:** 1,305 pollution alerts tagged, of which 1,161 could be linked to a likely cause (90.0%).

Air Pollution Alert Breakdown

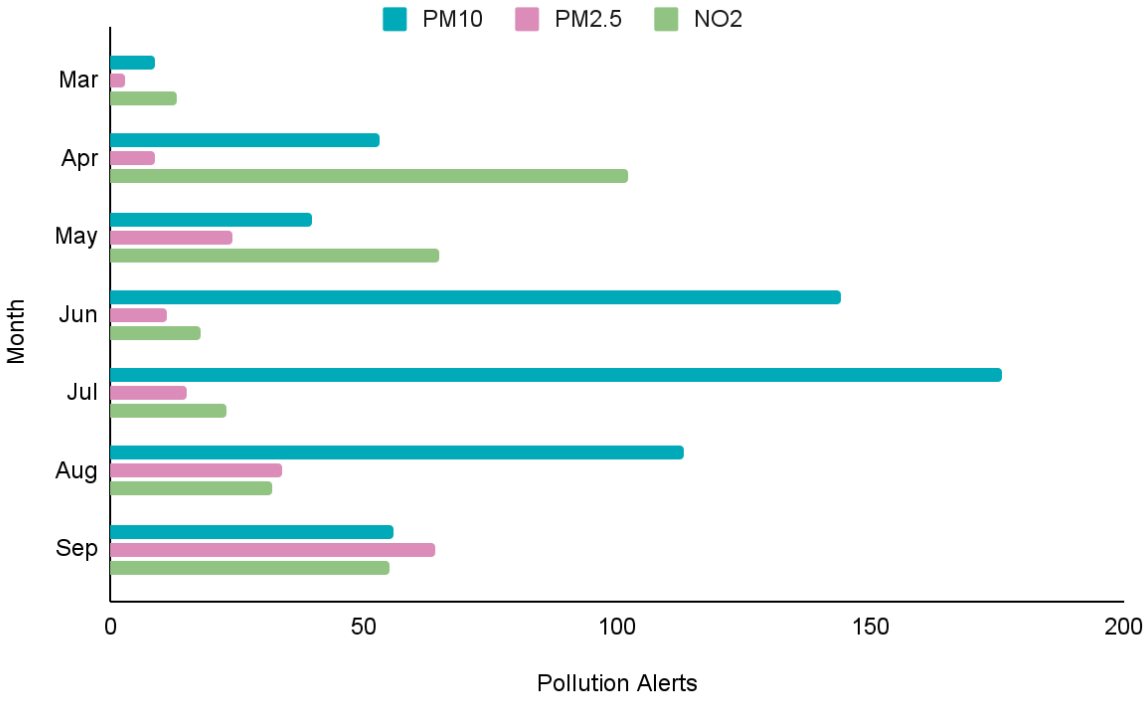


Figure 6a: Breakdown of air pollution alerts per month for PM10, PM2.5 and NO2 (North Zone).

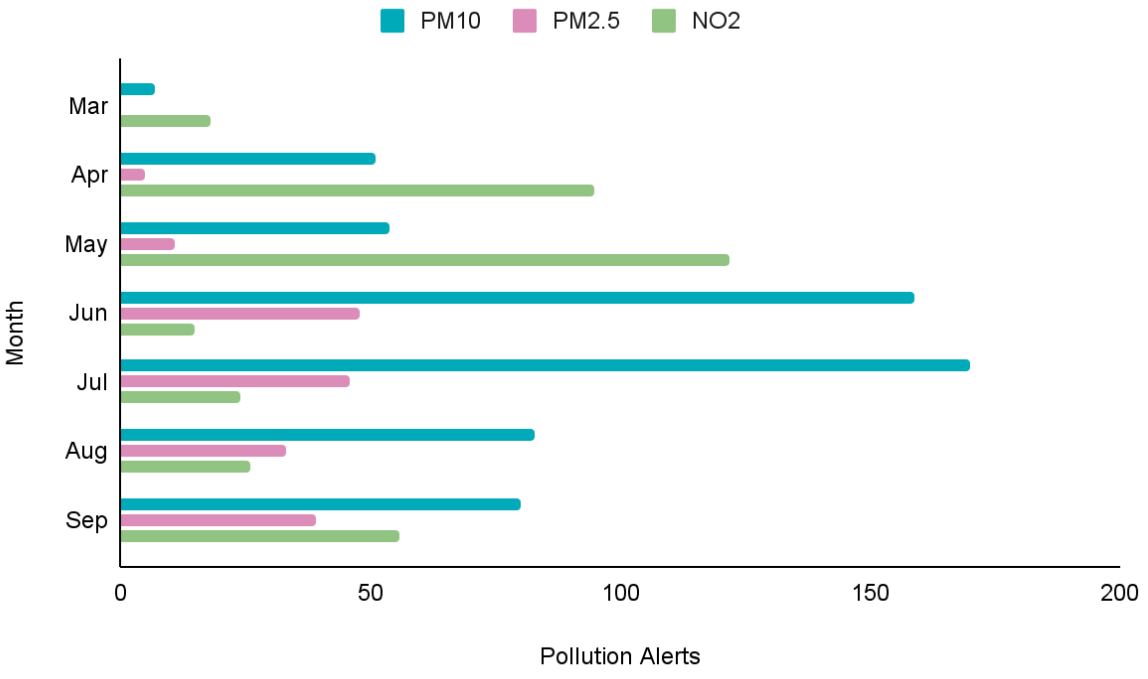


Figure 6b: Breakdown of air pollution alerts per month for PM10, PM2.5 and NO2 (South Zone).

- A total of 591 PM10 alerts were recorded at the North Zone, 73.2% of which were recorded in the summer months of June, July and August. Similarly, 604 PM alerts

were recorded at the South Zone, 68.2% of which were recorded during the summer months.

- PM2.5 accounted for 17.8% and 15.9% of air pollution alerts in the North and South Zone respectively. Multiple PM2.5 alerts were regularly recorded late at night during the last 4 months of the project, such as 8 alerts at the North Zone on the evening of 20th September/morning of 21st September, indicating potential burning or other activity were occurring out-of-hours.

- In comparison to PM10, NO2 alerts were more frequent in April, May and September at both zones, once again correlating with seasonal variation of NO2 levels. For example, in the South Zone, NO2 alerts dropped from 122 in May to 15 in June. Overall, NO2 alerts were responsible for 34.3% of all air pollution alerts in the North Zone, and 31.2% in the South Zone.

Pollution Causality

What did you identify as the most common likely causes of spikes?

These charts highlight the most frequent likely causes of pollution spikes to determine which activities recur in association with pollution (includes PM10, PM2.5, NO2 and Noise pollution alerts). Analysis was predominantly focused on vehicular activity on the public highway. Each pollutant alert was analysed individually to determine possible causality.

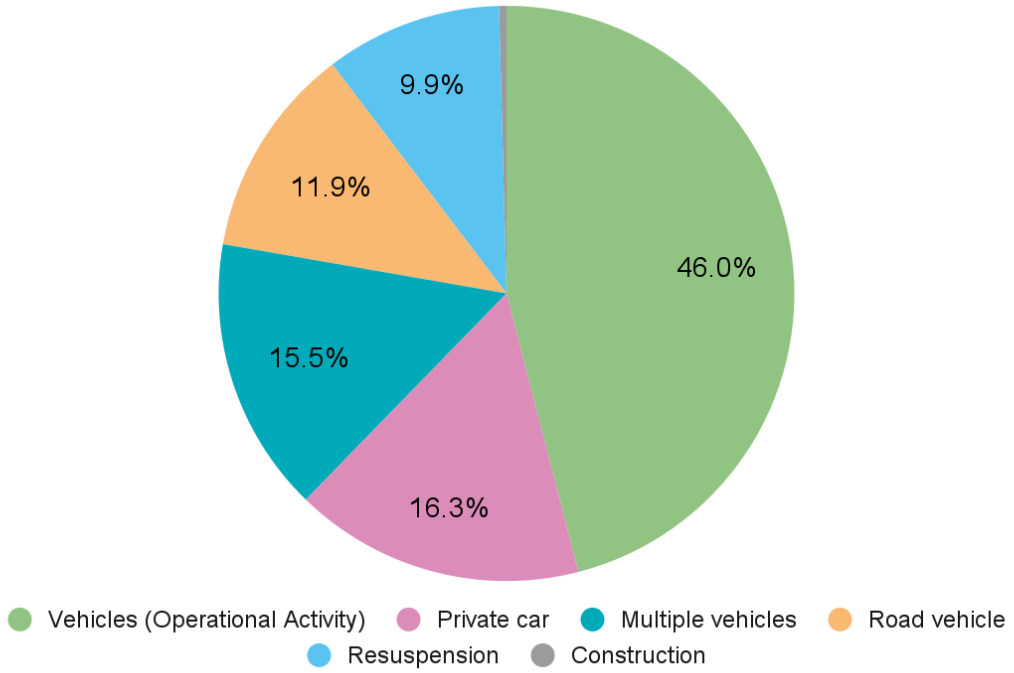


Figure 7a: Breakdown of the various potential pollution causes identified (North Zone).

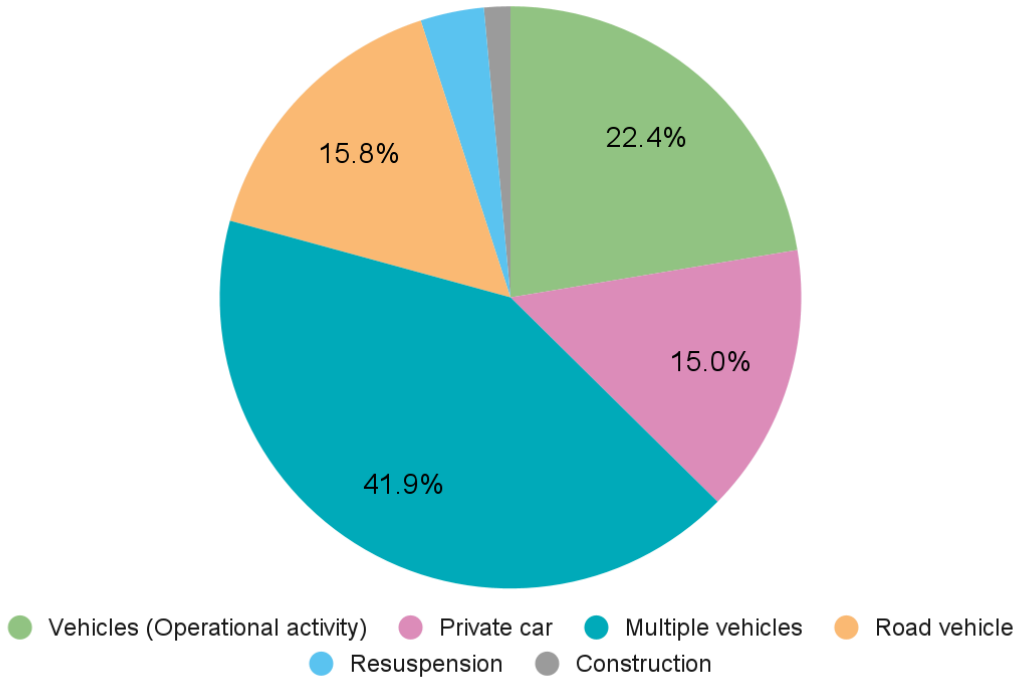


Figure 7b: Breakdown of the various potential pollution causes identified (South Zone).

- Overall, both zones displayed correlations between pollution spikes and operator vehicular activity, which accounted for 46% (440) and 49.9% (260) of spikes at the North and South Zone respectively.

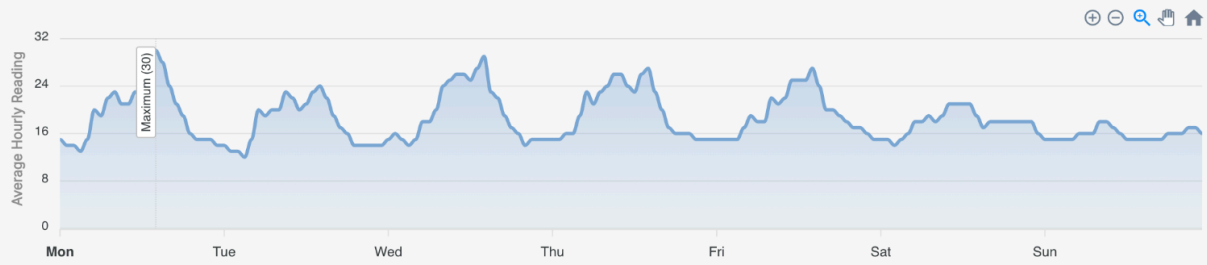
- Further notable activities associated with pollution spikes included multiple vehicles, particularly at the South Zone, as well as road vehicles (such as delivery trucks and vans), and private cars. As the North Zone is an enclosed cul-de-sac, it aligns with the findings that more vehicle movements are seen on the South Zone as they pass by in both directions of the street.

- PM pollution alerts were linked to various different vehicular behaviours, including vehicular movement instigating the resuspension of existing dust in the area. Resuspension was determined as a possible cause of PM alerts when minimal/no activity occurred and environmental conditions were more likely to cause pollution alerts (e.g. higher wind speeds).

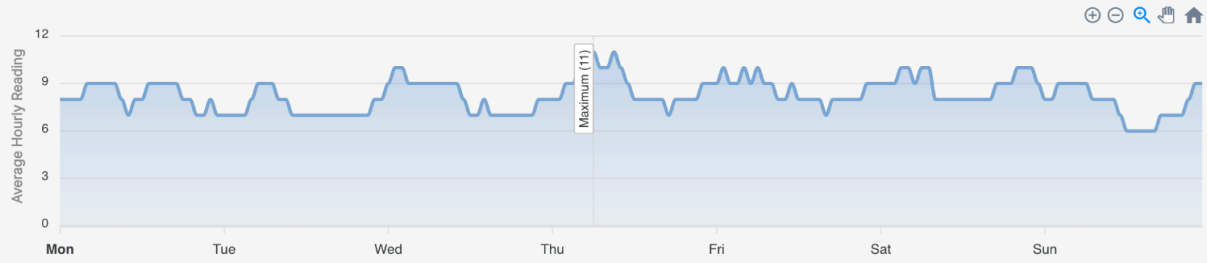
Typical week profile

By looking at the patterns during a typical week, you may be able to identify and tackle hotspots of activity to reduce overall levels. The average level over the week is based on all data recorded from installation of the equipment to decommissioning. For LAFMAX, the peak reading (LAFMax) seen in each minute is stored. Therefore these graphs are an average of the maximum levels seen every minute during the hour, rather than an average of the raw noise levels.

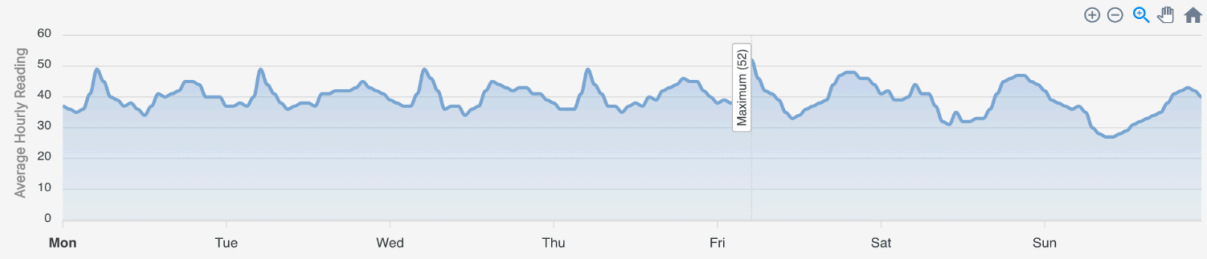
PM10



PM2.5



NO2



LAFMax

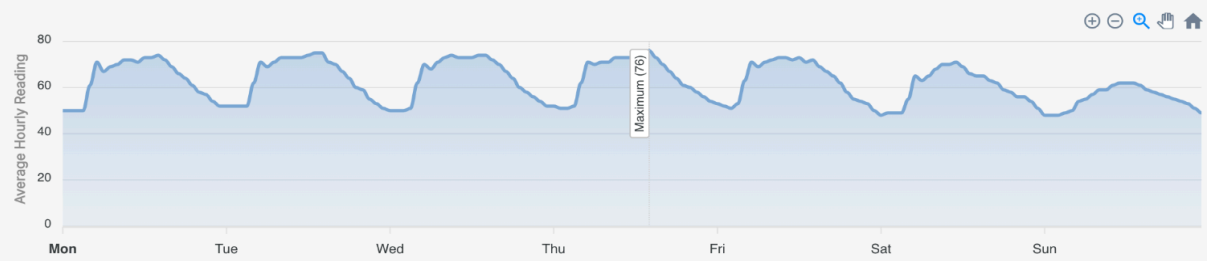


Figure 8a: North Zone

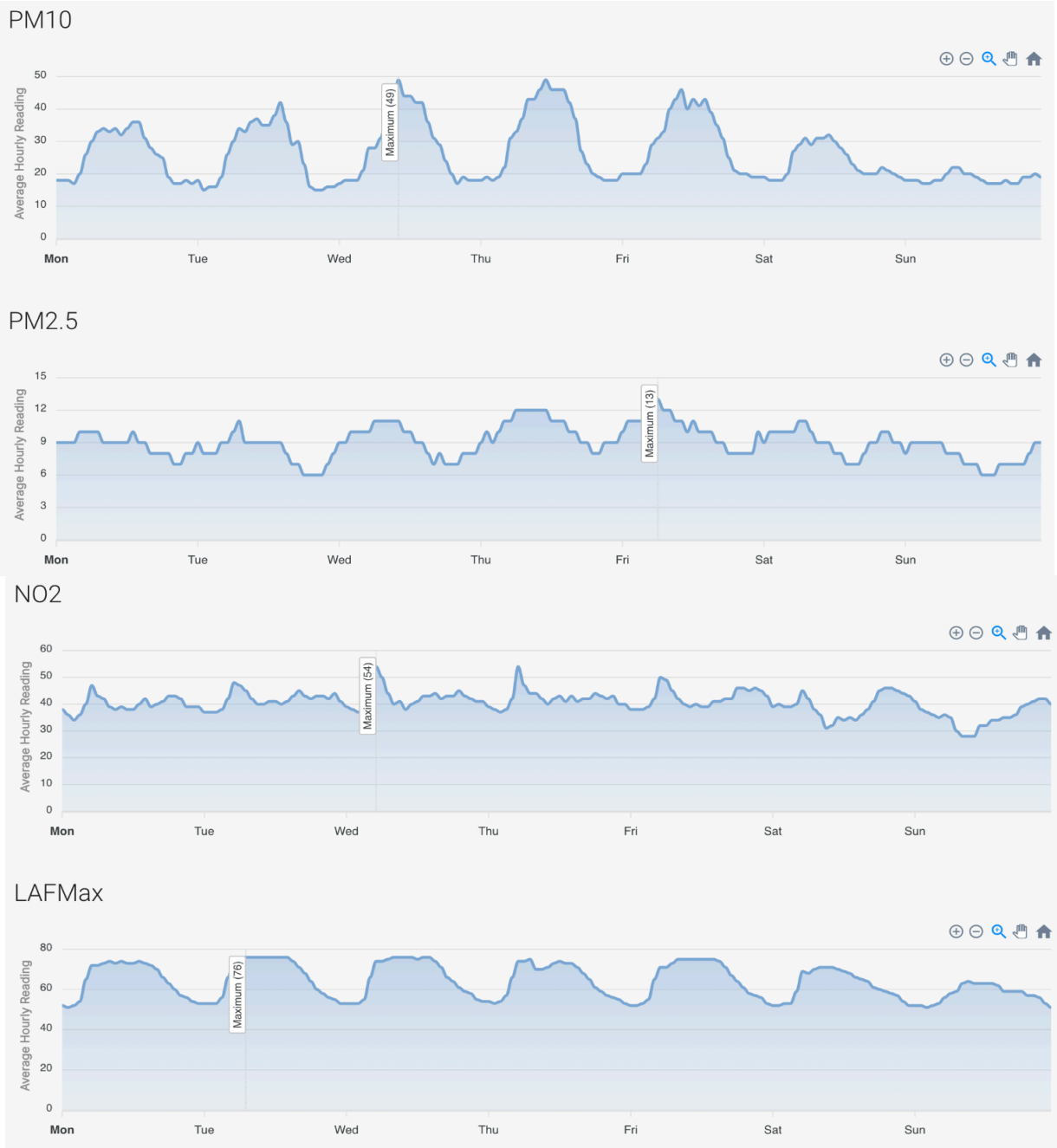


Figure 8b: South Zone

- Both zones displayed similar patterns across a typical week. Both average PM10 and Noise readings displayed significant peaks during daytime and troughs during out-of-hours. PM10 behaviour in this analysis is indicative of usual characteristics.

- Conversely, PM2.5 hourly averages highlighted peaks late at night through to the early hours of the morning, whilst decreasing during daytime activity. This suggests

PM2.5 producing activity may have been occurring in the area during these periods. However, similar to PM10, PM2.5 data displays behaviour indicative of its characteristics.

- NO2 displayed less variation in levels, which implies relatively high background NO2 in the area. NO2 hourly average peaks were observed during the early morning which correlates to vehicular and industrial activity commencing.

- For all pollutants, a visible drop in average levels (to varying degrees) was observed over the weekend, providing evidence of the impact vehicular and operational activities have increased pollution in Wandle Way.

- Wandle Way is regularly cleaned on Sundays, but the distinct rise in PM10 on Mondays indicates that this has a minimal, short-term impact on mitigating pollution in the area.

Notable patterns: May - July 2024 Case Study

Figure 9a: North Zone

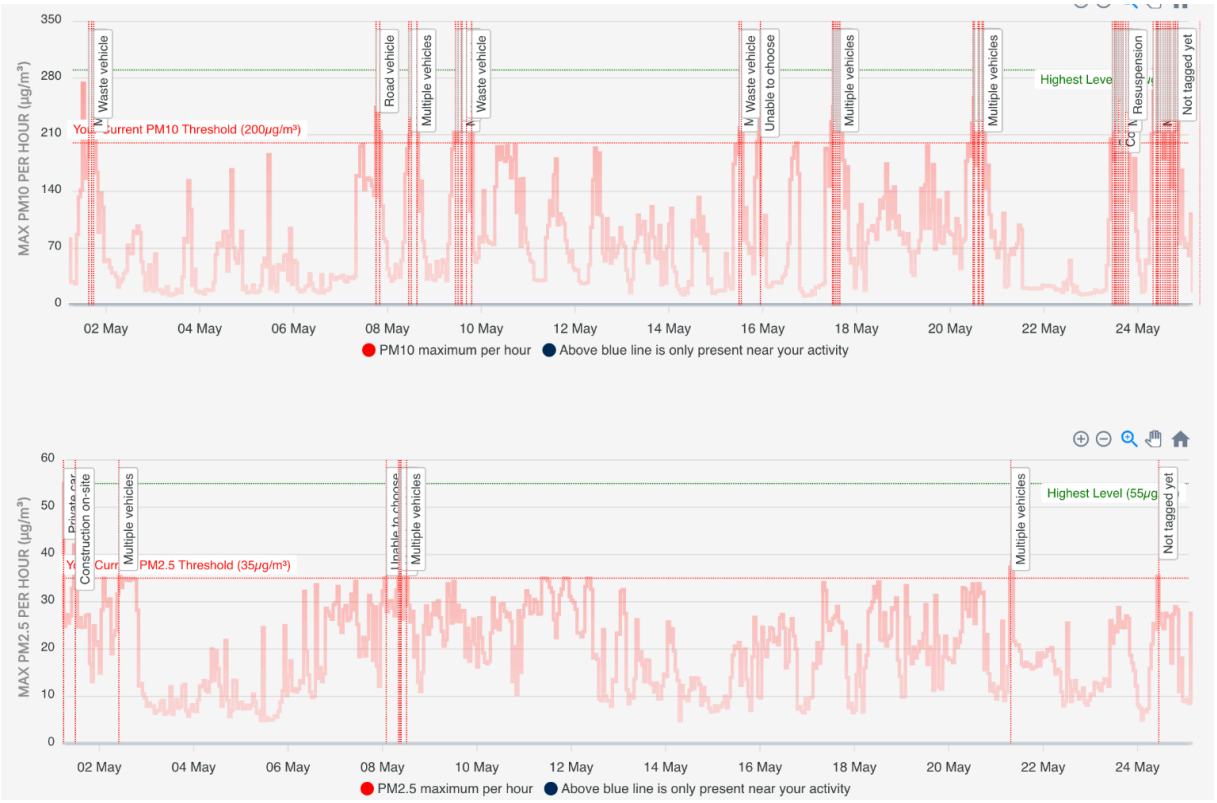


Figure 9b: South Zone

- Data indicates only a short-term improvement in PM10 levels following the extensive clean and dampening down of Wandle Way on 11th and 12th May, but appears more significant than at the north zone.

- Low PM10 from 21st-23rd May correlated with heavy rainfall on 21st and 22nd May (0.77 inches). This is supported by existing research on PM10, which indicates rainfall reduces PM10 in local areas (Mukta et al., 2020).

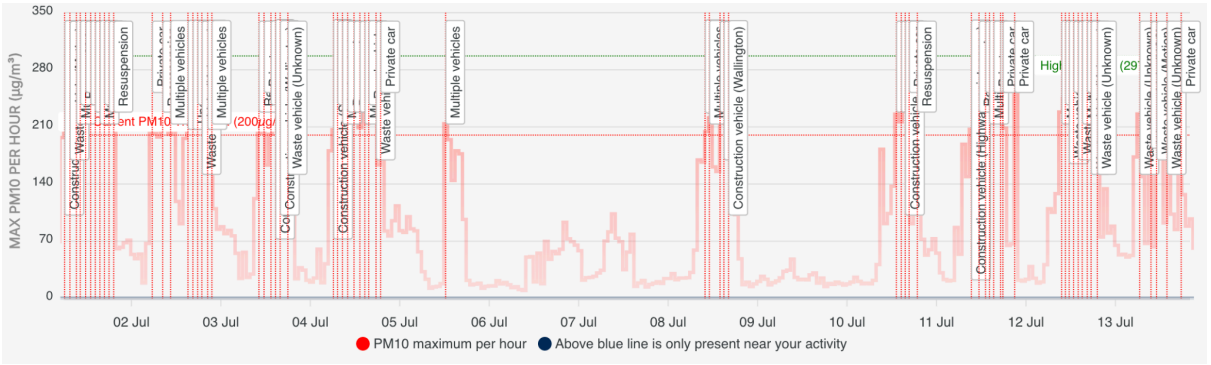


Figure 10a: North Zone

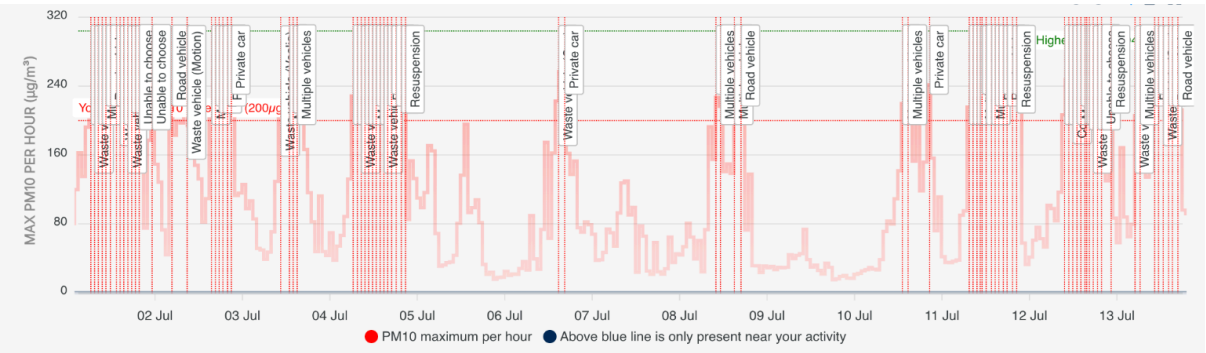


Figure 10b: South Zone

- The reduction in PM10 hourly averages and threshold exceedances in early July correlated with heavy rainfall, once again highlighting the impact of damp conditions on mitigating dust pollution.

- 1.24 inches of rainfall was recorded across the 5th, 6th and 7th July, as well as 0.55 inches on the 9th July (meteorological data obtained from Visual Crossing).

Impact of day-time activity

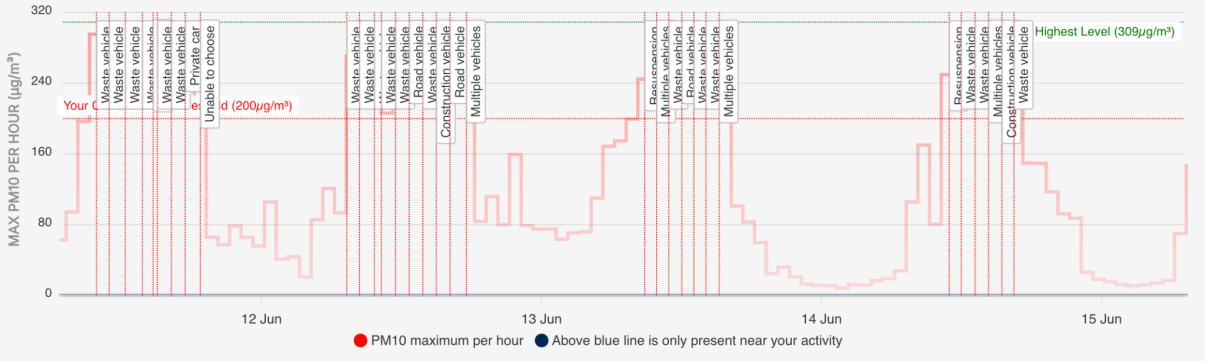


Figure 11a: North Zone

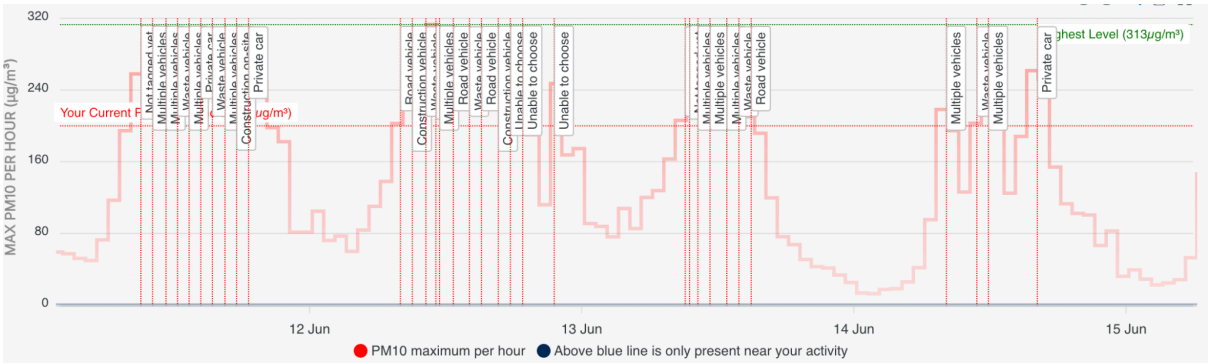


Figure 11b: South Zone

- The above hourly average graphs from 11th - 15th June highlight the variation of PM10 levels during busy daytime hours in comparison to out-of-hours. The correlation indicates the significant impact activities have on pollution in the local area, often caused by a combination of pollution-producing activities and resuspension of existing dust.

- Notably during this period, high wind speeds and gusts were recorded. On 13th June, average windspeed was 18m/s with gusts of 34m/s. Additionally, 14th July averaged 18m/s windspeed and 27m/s gusts. Despite these high wind speeds throughout, pollution levels continued to correlate with human activity, implying human activity had a greater influence on pollution in the local area than weather during this period. However, it is worth noting that this does not account for wind direction, which can influence pollution levels recorded by monitoring equipment.

Recommendations

Throughout the 6-month monitoring project, EMSOL, CRP, the London Borough of Merton and the Environment Agency have discussed how air quality can be improved on a long-term basis. Given industrial, construction, transport and logistics activity is a significant contributor to London's emissions, sites such as Wandle Way and the surrounding Willow Lane industrial estate play an important role in tackling pollution and protecting public health.

The following recommendations have been suggested to be implemented over the short and long-term:

Short term

- Continued monitoring: Continued data collection in the area will provide further evidence for targeted interventions and enable stakeholders to track the impact of mitigations and progress over time. The previous EMSOL pilot at Weir Road, also in the London Borough of Merton, has highlighted the importance of ongoing monitoring and control measures to facilitate long-term reduction in pollution.

- Data Sharing: Collaborate with local operators at the Willow Lane industrial estate by sharing EMSOL's pollution data insights and their impact, allowing them to adjust practices and behaviours to benefit the community. Crucial stakeholders involved in this engagement and training should be EMSOL, the Environment Agency, London Borough of Merton and the Business Improvement District.

- Support sustainable practices: Support organisations to make sustainable changes to their fleets/organisational practices, and record their depot locations to see if they map/overlay with existing monitoring data in boroughs or by monitoring providers.

- Action plans: Provide feasibility studies/action plans to support decarbonisation for the BID or individual organisations, assisted by data collected during this pilot. This will help to provide short-term guidance and approaches to improving air quality across the local area.

- Increased mitigation: Correlating data from the deep clean carried out on 11th and 12th May, and the regular cleans on Sundays, suggests that dust pollution returns to

previous levels within days, with pollution spikes regularly exceeding 200µg/m^3. Short-term mitigations may include:

- Greater coordination between the BID, Merton Council and the Environment Agency could improve control of operator behaviour. Informing the Environment Agency when deep cleans are set to take place will enable the Agency to monitor tracking out of dust pollution and more easily identify other sources of pollution coming from industry.

Long term

- Changes to permit controls and emission standards: Push for stricter air quality emission standards and tighter permit regulations for industry operating in the area where there is justification to do so. Integration of monitoring requirements into operator permits might help them to identify the sources of pollution. The key stakeholders involved in this will be the Environment Agency supported by the BID, London Borough of Merton, and collaborative relationships with operators on-site. **It will require Environment Agency advice on feasibility.**

- Funding: Air quality monitoring is key to setting a baseline and establishing targets when there are known air quality challenges in an area, and in turn helps encourage and nudge behaviour change. This needs to be funded so organisations can feel empowered to track their improving environmental behaviour long-term. This could be funded through BID membership levies, and communicating how important air quality is to the local members may help to establish a small fund to continue monitoring, tracking and improving the area. Public sector involvement could come from the Environment Agency, who are able to collaborate and support operators at industrial sites with mechanisms (such as those listed above) to reduce their emissions. In the long-term, specific funds could be created by local, regional, city and national level authorities to tackle emissions at challenging, pollution hotspot locations.

Appendix

1A: Wandle Way Raw Data from 25th March - 25th September 2024.
Data includes the highest pollution levels per hour for PM10, PM2.5, NO2 and Noise, and the mean per hour for PM10, PM2.5 and NO2 (both the North and South Zones)
Raw data sheet

1B: References

- Cross River Partnership (2024) https://crossriverpartnership.org/projects/smarter-greener-logistics/
- World Health Organisation (2021) https://www.who.int/news-room/feature-stories/detail/what-are-the-who-air-quality-guidelines
- Department for Environment, Food and Rural Affairs (2024) https://uk-air.defra.gov.uk/air-pollution/uk-limits.php
- Visual Crossing (2024) https://www.visualcrossing.com/weather-data
- Mukta T, Hoque M Hossain M, Sarker M Eusuf (2020). Seasonal variations of gaseous air pollutants (SO2, NO2, O3, CO) and particulates (PM2.5, PM10) in Gazipur: an industrial city in Bangladesh. Advances in Environmental Research. 6. 195-209. 10.22104/AET.2021.4890.1320.
- Greater London Authority (2024) https://www.london.gov.uk/programmes-strategies/environment-and-climate-change/climate-change/zero-carbon-london/pathways-net-zero-carbon-2030
- Youtube / EMSOL (2023) https://www.youtube.com/watch?v=vko7XTi0cFY&t=20s
- Office for Health Improvement and Disparities (2022) https://www.gov.uk/government/publications/air-pollution-applying-all-our-health/air-pollution-applying-all-our-health